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ART. VII. TWO NEW SPECIES OF LUMBRICIDÆ FROM ILLINOIS

BY

FRANK SMITH, A. M., AND ELIZABETH MAE GITTINS, M. A.

ART. VIII. TWO NEW VARIETIES OF EARTHWORMS WITH A KEY TO DESCRIBED SPECIES IN ILLINOIS

BY

FRANK SMITH, A. M.

ERRATA

Page 49, line 7 from bottom, page 69, line 8 from bottom, page 85, last line, and page 86, line 11 from bottom. for *chamæchrista* read *chamæcrista.*
Page 71, line 2 from bottom, for *Tetraophthalmus,* read *Tetraopes.*
Page 75, line 3 (second column) below first heading, for *Cistudo* read *Terrapene.*
Page 76, last line in first list, for *brevicaudis* read *brevicauda.*
Page 87, line 2 (second column) below first heading, for *carisce* read *cardisce.*
Page 214, lines 4, 7, and 11 above heading, for *flavicingulata* read *flavicingula.*
Page 283, line 19 from bottom, for *Simulidæ* read *Simuliidæ.*
Page 289, line 7, for *Bezzia* read *Probezzia.*
Page 409, line 23, after *p.* read *526.*
Page 531, line 12 from bottom, for *dissimilis* read *nivoriundus.*

ARTICLE VII.—*Two New Species of Lumbricidæ from Illinois.** By FRANK SMITH AND ELIZABETH MAE GITTINS.

But few species of endemic *Lumbricidæ* have been described from the United States and none from Illinois. The species here described and others of which descriptions are in preparation are of the small group which has had its chief development in North America and which has been designated by Michaelsen as the subgenus *Bimastus* of the genus *Helodrilus*.

Much of the matter in this paper is from a thesis presented by the junior author in partial fulfilment of the requirements for the degree of Master of Arts in the Graduate School of the University of Illinois. The thesis was prepared under the supervision of the senior author and based on material in his collections.

HELODRILUS (BIMASTUS) ZETEKI n. sp.

Definition.—Color of living worm, chestnut-brown tinged with purple, more pronounced anteriorly. Length, extended, 97–140 mm. Maximum diameter, 5–6.5 mm. at the clitellum. Somites, 100–142. Prostomium epilobic, ⅓–½. Setæ closely paired; anterior to the clitellum, *aa: ab: bc: cd: dd* = 6 : 1 : 5 : 1 : 20; posterior to the clitellum, *bc* is relatively greater, and *dd* is somewhat less. First dorsal pore, V/VI. Clitellum XXVII–XXXVII (= 11 somites); incomplete ventrally. Tubercula pubertatis lacking. Spermiducal pores on XV, inconspicuous, with the surrounding glandular areas encroaching but slightly on XVI. Septa VI/VII–XII/XIII are thickened and XIII/XIV and XIV/XV are more strongly thickened. Sperm sacs, two pairs, in XI and XII. Spermathecæ lacking.

The type, which is an Illinois specimen, and the paratypes are in the collection of the senior author.

The description of this species is based on specimens found in the woodlands of two localities near Urbana, Illinois, and in those of a locality near Douglas Lake in Cheboygan County, Michigan. The Illinois specimens were collected by Mr. James Zetek, for whom the species is named, and the Michigan specimens were collected by Miss Bessie Green, who was at the time a Research Assistant at the Uni-

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versity of Michigan Biological Station, located on the shore of Douglas Lake. These worms were found living in the wood and under the bark of decaying logs, and sometimes immediately beneath such logs.

EXTERNAL CHARACTERS

The purplish brown coloration is most pronounced on the anterior dorsal surface, and the under parts are distinctly paler. The clitellum is brownish buff. The length of the type specimen is 135 mm. and its maximum diameter is 6 mm., while the corresponding dimensions of the paratypes are 97–140 mm. and 5–6.5 mm. respectively. The Michigan specimens average somewhat smaller than those from Illinois. The diameter of the peristomium of the type specimen is about 3 mm., and then follows a gradual increase in diameter to XII, where it is 5 mm., and from there it remains uniform until the clitellum is reached, where the maximum of 6 mm. is attained. Posterior to the clitellum the diameter is nearly uniform and about 4 mm. This region is slightly flattened in the living worm and there are distinct dorso-lateral and ventro-lateral angles. There are 100 somites in the type specimen, which shows evidence of having lost a number of somites from the posterior end. In the paratypes the number is 134–142. The somites anterior to the clitellum are slightly longer and more distinct than the posterior ones.

The arrangement of the setæ in somites anterior to the clitellum is indicated by the formula *aa: ab: bc: cd: dd* = 6: 1: 5: 1: 20; *dd* equals one half of the circumference. Posterior to the clitellum, *bc* becomes relatively somewhat greater and *dd* somewhat less. The clitellum is on XXVII–XXXVII. In the type specimen it is not as well developed on XXVII as on the other somites. In one paratype it is on ½ XXVII–XXXVIII. The clitellum is saddle-shaped and reaches its most ventral limit on XXXIV, where the margins are only 1.33–1.5 mm. apart. On XXVII and XXVIII the ventral margin is slightly dorsad of *b;* on XXIX, between *a* and *b;* and on XXX–XXXVI, includes the ventral setæ. Tubercula pubertatis are lacking. The paired spermiducal pores are on XV, slightly dorsad of *b.* Each is in a deep transverse groove and is bordered by a slightly elevated glandular area which extends ventrally to *b*, anteriorly as far as XIV/XV, and posteriorly encroaches on XVI. The oviducal pores are small apertures slightly dorsad of *b* on XIV. The nephridiopores are large and easily seen, and their position is similar to those of other *Lumbricidæ.* They are near the anterior borders of the somites, some of them slightly farther dorsad than *b,* while others are approximately midway between the dorsal setæ and the mid-dorsal line.

INTERNAL CHARACTERS

The alimentary tract is similar in its parts and relations to those of other species of *Helodrilus*. The esophagus is of relatively small diameter in V–IX. The calciferous gland involves that part of the esophagus which is in X–½ XIV. In X the esophagus abruptly increases in diameter, especially in the frontal plane, and two lateral pouches are formed. In XI and XII the diameter diminishes slightly, and in XIII more rapidly, so that in the posterior part of the latter somite it is again small. The walls of the pouches in X have numerous longitudinal folds which are high on the lateral walls and low on the dorsal and ventral walls. These folds are continuous posteriorly with longitudinal radially arranged partitions which at their inner edges unite with the esophageal epithelium and at their outer edges meet the circular muscular layer of the esophageal wall. These partitions extend back to the middle of XIV, being wide in XI and XII, diminishing in width in XIII, and disappearing in the anterior half of XIV. The partitions divide the wide space between the esophageal epithelium and outer wall into longitudinal radially arranged cavities which extend from their anterior opening into the lateral pouches in X to their very inconspicuous posterior openings into the lumen of the esophagus in XIV. The cavities receive the secretions from the secretory layers of the partitions, each of which has two such layers and an included blood sinus. The partitions and included cavities are widest in the lateral and narrowest in the dorso-ventral transverse axes of the esophagus, while the esophageal lumen is narrowest laterally. The epithelial layer of the folds in X and of the esophagus in XI–½ XIV is ciliated. The calciferous gland of *H. zeteki* is very similar to that of a considerable number of other species of *Helodrilus* which have been examined by the writers. The number of partitions in the gland of *H. zeteki* in the few specimens examined is 60–64, which is a considerably larger number than that found in some species of smaller worms. The crop involves XV and XVI, and the gizzard, XVII and XVIII. Septa VI/VII–XII/XIII are thickened and XIII/XIV and XIV/XV are more strongly thickened.

The spermaries and spermiducal funnels have the usual positions in X and XI and the two sperm ducts of either side unite near XII/XIII and form a common duct extending just beneath the peritoneal layer to the anterior limit of XV. Rather large masses of gland cells surround the terminal parts of the sperm ducts and encroach on the cavity of XV and on that of either XIV or XVI. There are two pairs of sperm sacs, one pair in XI and one in XII. Those of the latter pair are the larger, and when fully developed their dorsal parts

meet above the esophagus. Ovaries, oviducal funnels, oviducts, and ovisacs have the usual positions and relations. No trace of spermathecæ has been found in the several series of sections carefully examined for them.

Helodrilus (Bimastus) longicinctus n. sp.

Definition.—Color of antero-dorsal part of living worm, rose-red. Length of extended specimens, 65–92 mm. Maximum diameter, 3.5 mm. at the clitellum. Somites, 98–122. Prostomium epilobic, ½–⅔. Setæ closely paired; *aa: ab: bc: cd: dd* = 10 : 1 : 7½ : ⅘ : 30. First dorsal pore V/VI. Clitellum, XXIII–XXXII or XXXIII (= 10 or 11 somites); incomplete ventrally. Tubercula pubertatis lacking. Spermiducal pores on XV conspicuous, with surrounding glandular areas encroaching slightly on XVI. Septa VI/VII and XIV/XV somewhat thickened and VII/VIII–XIII/XIV more strongly thickened. Sperm sacs, two pairs, one pair in XI, and the other in XII. Spermathecæ lacking.

The type and paratypes are in the collection of the senior author.

The description of this species is based on specimens found in the lawns and parkings of Urbana, Illinois.

External characters

The rose-red coloration is most pronounced on the antero-dorsal surface, the other parts being distinctly paler. The clitellum is flesh-colored. The length of the type specimen is 72 mm. and its maximum diameter 3.5 mm. at the clitellum. The diameter of the preclitellar part is slightly less than this, but somewhat exceeds that posterior to the clitellum. There are 98 somites in the type specimen and 98–122 in the paratypes. Each somite is divided by an indistinct median annulus, and the anterior half of the somite has a somewhat fainter coloration than the posterior. The length of the anterior somites does not exceed that of the posterior ones. The relative distances between the setæ indicated by the formula *aa: ab: bc: cd: dd* = 10 : 1 : 7½ : ⅘ : 30, apply to the arrangement both anterior and posterior to the clitellum. In one specimen, *bc* is relatively greater and *dd* correspondingly less.

The clitellum is on XXIII–XXXII or XXXIII, and is saddle-shaped. Its ventral margins converge slightly from XXIV to XXXI and on XXVII–XXXI reach *b*, which is the ventral limit of the clitellum. No traces of tubercula pubertatis are recognizable. The paired spermiducal pores are on XV, slightly dorsad of *b*. Each is sur-

rounded by a comparatively prominent glandular area which extends ventrally to *b*, and encroaches on XVI. The oviducal pores are small apertures slightly dorsad of *b*, on XIV. The nephridiopores are distributed in a manner quite similar to that described in *H. zeteki*.

INTERNAL CHARACTERS

The septa VI/VII and XIV/XV are somewhat thickened and VII/VIII–XIII/XIV more strongly thickened. The calciferous gland has the ordinary lumbricid structure. The esophagus is abruptly doubled in diameter in X, and forms the anterior part of the gland, this gland extending to the middle of XIV, but with gradually decreasing diameter. The gland has about 60 longitudinal partitions. The typhlosole begins in XX. The principal difference between the structure of the circulatory system and that ordinarily found in the genus is in the relative size of the "hearts" of XI. In all of the specimens examined, they are uniformly much smaller than those of somites anterior to XI. We have found no such difference in size in other species. Nothing has been noticed in which the structure of the nervous and excretory systems differs from that in related species.

The spermaries and spermiducal funnels have the usual positions in X and XI, and the terminal parts of the sperm ducts are surrounded in XV by rather large masses of gland cells which encroach somewhat on the cavities of that somite and of XVI. There are two pairs of sperm sacs, one pair in XI and one in XII. The various female reproductive organs have the usual positions and relations except that spermathecæ are entirely lacking.

Affinities of the two New Species

In a recent paper, Michaelsen ('10) has united the genera *Eiseniella*, *Eiseenia*, and *Helodrilus*, and recognizes only *Lumbricus*, *Octolasium*, and *Helodrilus* as distinct lumbricid genera. He includes in the subgenus *Bimastus* of the genus *Helodrilus* species having no spermathecæ, no sperm sacs except in XI and XII, the tubercula pubertatis indistinct or lacking, and the clitellum not extending posterior to XXXII/XXXIII. *H. zetcki* meets this fourfold requirement except in the last character, and in this respect it differs much from its most nearly related species; nevertheless, it seems reasonable to assign it to the subgenus *Bimastus*.

H. longicinctus is clearly included within the same subgenus, and so closely resembles some of the species already described as to make it desirable to state the grounds on which it has been thought necessary to establish another species. *H. (B.) beddardi* (Mich.) has the

clitellum on XXIV or XXV–XXXI or ½ XXXII, but has indistinct tubercula pubertatis, very little glandular tissue about the spermiducal pores, and, what is perhaps more important, has the septa of VI–XV all thin, while in *H. longicinctus* these septa are strongly thickened. Finally, in the latter species the "hearts" of XI are much smaller than those anterior to that somite, while in *H. beddardi* (Mich.) the "hearts" of XI are similar in size to the others. Michaelsen ('10: 64) reports a specimen from Tibet, in which the clitellum is on XXIII–XXXII and which he considers to be *H. beddardi* (Mich.), but not enough characters are given to permit a decision concerning the relationship of this specimen to *H. longicinctus*.

H. (B.) parvus (Eisen) has the clitellum quite uniformly on XXIV–XXX in specimens from North America. The tubercula pubertatis are indistinct and variable, and on XXV or XXVI–XXIX or XXX. Michaelsen ('09: 248) refers to a specimen from Kashmir, in which the clitellum is on XXV–XXX and the tubercula pubertatis on XXVI–XXIX. In another paper ('10: 64) he mentions two specimens from China in which the clitellum is on XXIII–XXX, and also expresses a doubt as to the actual specific distinctness of *H. (B.) parvus* from *H. beddardi* (Mich.). Whatever the final decision concerning the relations of these two species may be, it can not, in the opinion of the writers, invalidate the distinctness of *H. longicinctus* in view of the differences mentioned above.

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